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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/754,235	01/03/2001	Richard Hsiao	SJO990204US1	2602

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CAMPBELL, CA 95008

EXAMINER

AHMED, SHAMIM

ART UNIT

PAPER NUMBER

1765

7

DATE MAILED: 03/18/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

09/754,235

Applicant(s)

HSIAO ET AL.

Examiner

Shamim Ahmed

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-38 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-38 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.  
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

## Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All b) ☐ Some \* c) ☐ None of:  
1. ☐ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).  
\* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).  
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

## Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_.
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_ 6) ☐ Other: \_\_\_\_.

**DETAILED ACTION**

***Response to Arguments***

1. Applicant's arguments with respect to claims 1-38 have been considered but are moot in view of the new ground(s) of rejection.

***Claim Rejections - 35 USC § 102***

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 1-3 are rejected under 35 U.S.C. 102(b) as being anticipated by Roth et al (5,272,117).

As to claims 1 and 3, Roth et al teach that a plurality of upwardly projecting components (14) are formed on a substrate (12) and a polish-stop layer (18) is formed over the components (col.3, lines 5-18 and lines 51-52 and figure 2).

Roth et al also teach that a polishable layer (20) is deposited above the etch-stop layer (col.4, lines 5-8).

Roth et al, teach that a polishing step is performed for planarizing the polishable layer at a point in time wherein the polish-stop layer is exposed using a polishing slurry in a chemical mechanical polishing (CMP) process (col.4, lines 14-18, lines 38-41).

Roth et al, further teach that a portion of the stop layer is removed subsequent to the polishing step (col.5, lines 10-11).

As to claim 2, Roth et al teach that the polish-stop layer polishes at a slower rate than the material to be polished (col.3, lines 51-55). So, the polish-stop layer is more resistant to the polishing slurry compare to the polishable layer.

***Claim Rejections - 35 USC § 103***

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

6. Claims 5-7,9-10,15,17-19 and 21-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Roth et al (5,272,117) as applied to claims 1-3 above, and further in view of Cheng et al (6,086,777).

As to claim 15, Roth et al discussed above in the paragraph No 3 above and also teach that the planarizing or polishable layer (20) is deposited over the projected components (14) to cover the entire surface of the substrate (see figure 4).

So, it would have been obvious that the depth of the polishable layer is greater than the projected height of the components.

Roth et al fail to teach explicitly that a polishing stop layer is directly upon the top surface of the components.

However, in a method of making interconnect, Cheng et al teach that a polishing stop layer (18) is deposited directly on the top surface of the components (14) for preventing conductive material from diffusing into the diffusion region or into the component regions (col.5, lines 36-42).

Therefore, it would have been obvious to one ordinary skilled in the art at the time of claimed invention to combine Cheng et al's teaching into Roth et al's teaching for preventing conductive material from diffusing into the diffusion region or into the component regions as taught by Cheng et al.

As to claims 5-7 and 17-19, Cheng et al also disclose a polishing -stop layer of tantalum (18) having a thickness range from about 300 to about 500 angstroms (col.5, lines 37-49).

As to claims 9-10 and 21-22, Cheng et al teach that a portion of the polish-stop layer using ion-etching process, wherein the etching gas comprises argon (col.3, lines 64-col.4, lines 3 and col.5, lines 17-20).

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7. Claims 11-13, 23-25, 27, 29-31, 33-37 are rejected under 35 U.S.C. 103(a) as being unpatentable over Roth et al (5,272,117) in view of Cheng et al (6,086,777) as applied to claims 5-7,9-10,15,17-19,21-22 above, and further in view of Jaso et al (5,246,884).

Modified Roth et al discussed above in the paragraph No 6 above and also teach that the etch-stop or polish-stop layer could comprises diamond (col.3, lines 51-58).

As to claims 12-13,24-25,29, 33,36-37, Roth et al fail to teach that the polish-stop layer is diamond-like-carbon (DLC).

In a method of using an etch-stop or polish-stop layer, Jaso et al teach that diamond or diamond-like-carbon (DLC) can be used as an etch stop layer (col.3, lines 24-28).

Jaso et al also teach that the stop layer is removed by a reactive ion etching such as oxygen ashing process (col.3, lines 53-55 and col.4, lines 52-53).

Therefore, it would have been obvious to one skilled in the art at the time of claimed invention to employ Jaso et al's teaching into Roth et al's method because both the diamond and diamond-like-carbon (DLC) are functionally equivalent as taught by Jaso et al.

As to claim 27, Roth et al teach that the first layer (16) is deposited to maintain the topography of the projected components (14) (col.3, lines 24-35).

So, it would have been obvious to have the deposited depth of the first layer smaller than the projected height of the components.

As to claims 11, 23 and 35, Roth et al teach that the etch-stop layer is polished at a slower rate than the polishable layer (col. 3, lines 52-54).

Roth et al also teach that the exposed stop-layer is removed subsequent the polishing process (col.5, lines 10-11).

As to claims 33 and 34, Cheng et al teach that a portion of the polish-stop layer using ion-etching process, wherein the etching gas comprises argon (col.3, lines 64-col.4, lines 3 and col.5, lines 17-20).

8. Claims 8, 20 and 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Roth et al (5,272,117) in view of Cheng et al (6,086,777) and Jaso et al (5,246,884) as applied to claims 11-13,23-25,27,29-31,33-37 above, and further in view of Martin et al (5,707,409).

Modified Roth et al discussed in the paragraph 7 above but fail to teach that the thickness of the DLC is in the range of approximately 200 Angstroms.

However, in a method of hard carbon coating, Martin et al teach that most preferable thickness of a DLC film is in the range of 100 to 5000 Angstroms.

Martin et al also teach that it is expensive to make a thicker film and also becomes brittle and lose adhesion (col.8, lines 20-31).

Therefore, it would have been obvious to one skilled in the art at the time of claimed invention to combine Martin et al's teaching into modified Roth et al's teaching in order to form a DLC film with lower thickness such as approximately 200 Angstroms

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because thicker film becomes relatively expensive, brittle and lose adhesion as taught by Martin et al.

9. Claims 14, 26 and 38 are rejected under 35 U.S.C. 103(a) as being unpatentable over Roth et al (5,272,117) in view of Cheng et al (6,086,777) and Jaso et al (5,246,884), as applied to claims 11-13, 23-25, 27, 29-31, 33-37 above, and further in view of Yang et al (6,153,116).

Modified Roth et al discussed above in the paragraph 7 but fail to teach that the end point of the CMP process is determined by monitoring a polishing motor current.

However, in a method of end point detection of a CMP process, Yang et al teach that it is conventional to monitor the polishing motor current in order to detect an end point of a CMP process (col.3, lines 45-67).

Therefore, it would have been obvious to one skilled in the art at the time of claimed invention to combine Yang et al's teaching into modified Roth et al's process for efficiently detecting the end point of the polishing process as taught by Yang et al.

### ***Response to Arguments***

10. Applicant's arguments with respect to claim 1 have been considered but they are not persuasive.

Applicants argue that Roth et al do not teach that the last step of claim 1 such as "removing portions of said stop layer subsequent to said polishing step".



This is not persuasive because Roth et al clearly teach that after polishing the polishable layer, portions of the etch stop layer is removed (col.5, lines 10-11 and also see the figures 7-9).

### ***Conclusion***

11. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Shamim Ahmed whose telephone number is (703) 305-1929. The examiner can normally be reached on M-Thu (7:00-5:30) Every Friday Off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Benjamin Utech can be reached on (703) 308-3836. The fax phone

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numbers for the organization where this application or proceeding is assigned are (703)-872-9310 for regular communications and (703) 872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

Shamim Ahmed  
Examiner  
Art Unit 1765

SA  
March 16, 2003



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